

LIVERMORE LAB REPORT

A weekly review of scientific and technological achievements from Lawrence Livermore National Laboratory, Sept. 9-13, 2013.

WALL STREET
JOURNAL

TURN THOSE LIGHTS OFF



Remember our parents reminding us to turn the lights off. It was sound advice.

By some measures, the home is one of the more energy inefficient zones in the United States. Lawrence Livermore, making a number of assumptions about energy use in homes, estimates that in 2012 some 35 percent of the energy that was piped into U.S. households was "rejected." Like the heat that rises from light bulbs or that drifts from toasters, it's, in essence, wasted.

"We're tracking the thermodynamic efficiency," says A.J. Simon, who helps crunch the numbers at the Lab.

Livermore divides its analysis into four sectors: residential, commercial, industrial and transportation. Only the vehicles we drive are more inefficient than the houses we live in. Antiquated appliances, energy-gobbling heating and air-conditioning systems -- the list can add up quickly.

To read more, go to [The Wall Street Journal](#).



Akima employee Beth Palma is a National Ignition Facility (NIF) diagnostic engineer/deputy systems section manager.

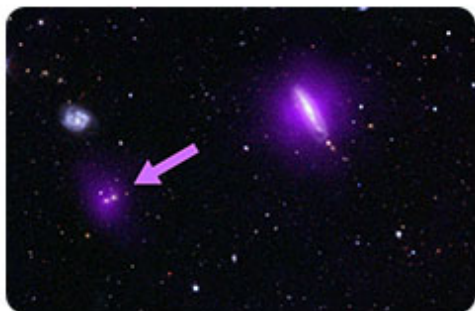
Lawrence Livermore National Laboratory gave services and supplies contracts worth about \$219 million to small businesses so far this year.

That works out to about 63 percent of the \$350 million the Lab has spent as of July 31 on these types of contracts.

Livermore Lab is run by the Department of Energy, which has set a goal for the lab of giving 52 percent of those contracts to small businesses, which are defined by the number of their employees or their revenue.

Businesses owned by veterans got about \$35 million in contracts from the Lab, while those owned by women got almost \$10 million worth of contracts.

To read more, to the [San Francisco Business Times](#).



Black holes surrounded by disks of gas were captured by NuSTAR.

NASA's black-hole-hunter spacecraft, the Nuclear Spectroscopic Telescope Array, or NuSTAR, has bagged its first 10 supermassive black holes. NuSTAR, which has a mast the length of a school bus, is the first telescope capable of focusing the highest-energy X-ray light into detailed pictures.

The Laboratory was involved in both the design and testing of the X-ray optics that fly on NuSTAR.

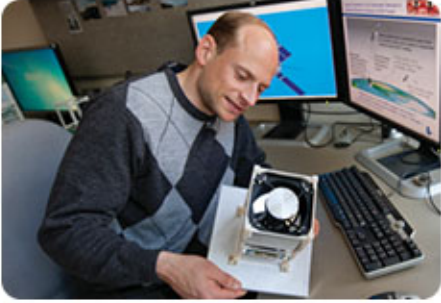
The new black-hole finds are the first of hundreds expected from the mission over the next two years. These gargantuan structures -- black holes surrounded by thick disks of gas -- lie at the hearts of distant galaxies between 0.3 and 11.4 billion light-years from Earth.

The teams running the telescope found the black holes serendipitously. They were looking at known targets and spotted the black holes in the background of the images.

To read more, go [Wired](#).

SKY
& TELESCOPE

SPACE COPS TO THE RESCUE



LLNL project scientist Vincent Riot holds the three-unit STARE CubeSat, which aims to monitor space junk more accurately than current technology.

Engineers at Lawrence Livermore and the Naval Postgraduate School have built tiny, GPS-enabled telescopes, which are composed of three stacked Rubik's Cube-sized boxes. The goal of these nanosatellites, dubbed CubeSats, is to pinpoint space-junk trajectories, outdoing the accuracy of ground-based tracking tools by a factor of 100.

The Space Surveillance Network, a global network of more than two dozen ground-based optical telescopes and radar stations operated by the U.S. Joint Space Operations Center (JSOC), keeps tabs on every satellite and spacecraft in Earth orbit. The system also tracks 20,000 pieces of space debris bigger than a baseball, which could cripple a satellite.

"We want to lower the alarm notification from once per month to once per lifetime of the satellite," says lead project scientist Vincent Riot of LLNL. "(Commercial) satellites only have so much fuel onboard, and you don't want to waste it" by moving them unless it's essential.

To read more, go to [Sky & Telescope](#).

proto ANY BREATH YOU TAKE



Although breath as a clue to disease was long ago replaced by more precise diagnostic tests, scientists have recently returned to breath's repository of chemicals -- about 3,000 compounds have been measured so far -- to look for markers that could indicate the presence of a particular disease or gauge how well a patient is responding to treatment.

Breath has several potential advantages as an analytic tool. Unlike blood and urine, it can be sampled frequently and noninvasively, it's never in short supply, it generates little or no infectious wastes, and results could be produced in real time using newer technology that can collect and analyze its compounds instantly.

Through analysis, Lab researchers are working on diagnostics that would differentiate the compounds found in breath indicating a disease and those found in healthy people. But breath also can be tough to trace a line between abnormal physiology and compounds found in breath. It's often not clear whether the concentration of a particular compound in breath is normal.

"There's a very broad normal distribution of certain compounds such as acetone in the breath of healthy people, and that range overlaps with the range in those who have diabetes," says Matthias Frank, leader of the Advanced Instrumentation and Diagnostics Group at Lawrence Livermore National Laboratory. "So where do you draw the line for diagnostic purposes?"

To read more, go to [Proto](#).

LLNL applies and advances science and technology to help ensure national security and global stability. Through multi-disciplinary research and development, with particular expertise in high-energy-density physics, laser science, high-performance computing and science/engineering at the nanometer/subpicosecond scale, LLNL innovations improve security, meet energy and environmental needs and strengthen U.S. economic competitiveness. The Laboratory also partners with other research institutions, universities and industry to bring the full weight of the nation's science and technology

community to bear on solving problems of national importance. To send input to the *Livermore Lab Report*, send [e-mail](#)